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The Relation of Dancing Experience and Personality to Perception[1]

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I. Introduction

Witkin and his collaborators (9) have published data suggesting stable, characteristic differences among college students, children, and hospitalized psychiatric patients in space-orientation tests and in other perceptual and body-action tests; and they have conceptualized the perceptual dimension underlying these differences as ranging from dependence on the visual field on the one hand, to ability to separate an item (including the body) from the visual field, on the other.

Sex differences were also reported, showing that women were significantly more dependent on the visual field than men. The individual differences in perception were then related to personality variables by correlating perceptual performance with performance on personality tests—that is, the Rorschach test, the Figure-Drawing Test, the Thematic Apperception Test, and a Biographical Interview.

In Witkin's view, the space-orientation work was the result of attempts to "separate" (9, p. 5) the determinants of the perception of the upright—viz., the visual framework of our environment, and the gravitational cues given by our bodies—in order to establish whether a given impression of the upright is formed with reference to the body position, the visual framework, or both. Thus Witkin assumes that the objective environment, consisting of the influence of gravity and of the visual field, is identical with the psychological environment of the subjects in the test situations.

As a result of their studies, Witkin and his collaborators (9) concluded that, though the apparent cues being manipulated in the spatial orientation situations were the visual framework, on the one hand, and the bodily sensitivity to kinesthetic cues of the gravitational upright on the other, an individual's perception is a function of personality variables deeply rooted in his psychological makeup.

[1] This monograph is based on a thesis (3) submitted to New York University in partial fulfillment of the degree of Doctor of Philosophy. It owes much to Professor Thomas N. Jenkins for his advice and encouragement throughout the study and preparation of this final report; and to Dr. H. A. Witkin, who placed his laboratory facilities and research data at my disposal and generously gave me the benefit of his long experience with this type of problem. Drs. Max Hertzman, Daniel Lehrman, Helen Lewis, Karen Machover, Jay Rosenblatt, T. C. Schneirla, and Seymour Wapner contributed important suggestions at various stages of the writing of this manuscript. To Dr. Ralph Gundlach, Bonnie Bird, Dr. Martin Green, and Alice Green, who provided the dancers, and to the dancers themselves, goes a special debt of gratitude and appreciation. Judith Gruen and Paul Rabinowich gave their time generously for the interview scoring. Thanks are due to the editor of this monograph for critical and careful reading. Finally this study could not have materialized without the generous help of my wife Judith Gruen.

II. The Problem

Whether differences in extent of postural and kinesthetic bodily experiences are a factor in the perception-personality results was not considered by Witkin and his collaborators (9), although an effort was made through training to encourage more effective use of those experiences. This training, however, did not seem to change an individual's initially preferred way of perceiving. It becomes of some importance, therefore, to see whether the individual differences in spatial orientation, and the personality-perception relationships noted by Witkin *et al.* (9) can be verified in a special group of people, such as dancers, whose occupation involves relevant experiences. Increased sensitivity to bodily sensations is one of the objectives in the training of dancers, and is achieved by providing training in muscular awareness and kinesthetic sensitivity.

Accordingly, this investigation is devoted to a study of similarities and differences between the college group (used by Witkin) and a group of dancers—in perceptual performance, body action, and perception-personality relationships—for the purpose of evaluating the role of the dancers' special bodily experiences.

III. Method and Procedure

Perception Tests

The present experiment, following Witkin's suggestion, uses the Rod-and-Frame, Tilting-Room-Tilting-Chair, Stabilometer, and Embedded Figures tests. The first three are designed so that perception of the upright based on postural cues will yield scores different from those based on the visual field. (For a more detailed description of all of the tests, see Witkin [9].)

The Rod-and-Frame Test. In this test the subject is presented with a frame and rod tilted to the same side or opposite sides in the fronto-parallel plane, in a completely darkened room. He is required to adjust the rod to the true upright, while the frame remains fixed. The subject's body is upright, or inclined 28 degrees to the left or to the right. The rod and frame are similarly inclined either left or right at 28 degrees. The test is described as making it possible thus to determine the extent to which the subject can overcome the influence of the displaced visual field (*a*) when it is easy to use the body, as when sitting upright, and (*b*) when it is difficult to use the body, as when it is tilted. The score is the difference in degrees between the established upright and the true upright. Three series of trials, each consisting of eight trials, comprise the test:

Series 1: The subject is tilted to one side, and the frame is tilted to the same side, while the rod is adjusted to the upright.

Series 2: Body and frame are tilted to opposite sides.

Series 3: The body is erect while the frame is tilted to one side or the other.

The Tilting-Room-Tilting-Chair Test. The apparatus for this test consists of a small room, through the rear of which a chair mounted on a shaft is projected. The room and the chair can be tilted independently to the left or right. In this test, room and chair are tilted and the subject is required to adjust either the room or the chair to what he believes the true upright to be. Four trials, representing different conditions, are employed:

Series 1*a*: Room and chair are initially tilted to the same side, and the task is to adjust the room to the upright. Four trials are given under this condition.

Series 1*b*: Room and chair are initially tilted to opposite sides, and again the room must be adjusted to the upright. Four trials are given.

Series 2*a*: Room and chair are initially tilted to the same side, and the chair must be adjusted to the upright. Three trials are given under this condition.

Series 2*b*: Room and chair are initially tilted to opposite sides, and the chair must be brought back to the upright. Three trials are given under this condition.

In Series 1*a* and 1*b*, involving adjustment of the room, the initial tilts of room and chair are 56 and 22 degrees, respectively. In Series 2*a*, and 2*b*, involving adjustment of the chair, the initial tilts of room and chair are 35 and 22 degrees, respectively.

Judgments of the upright are seen here as based on information the subject can gather from his own body and from the visual field

provided by the surrounding room. The situation is seen as providing a measure of the extent to which a subject is able to use his bodily sensations as a basis of judgment of the upright, and the extent to which he relies on the prevailing field (9). The score on each trial is the difference in degrees between the final position of the room or chair as established by the subject, and the true upright.

The Stabilometer Test. This test evaluates a subject's ability to maintain body balance standing on a platform which is pivoted at its center, while confronted with a visual field (an enveloping cube) that is either stationary or rocking rhythmically from side to side. The test consists of four one-minute trials under two conditions: (*a*) The cube, a luminescent frame with strips of wood projecting from its corners so as to "encase" the subject, is stationary; and (*b*) The cube rocks from side to side. The longer the subject can keep the platform on which he stands horizontal, the better his equilibrium—thus, the better the score. Three scores are evolved:

1. The mean platform score for four trials under stable field conditions.
2. The mean platform score under unstable field conditions.
3. The number of seconds the subject touches the surrounding guard rail to steady himself gives the "time on rail" score.

Witkin found this test bore only a remote relationship to the above orientation tests; for this reason he did not include it in his personality study. However, the test is introduced here because it is a body-balancing test, and it was expected that the dancers' ability to involve their bodies in this balancing task would afford a useful measure of comparison to their ability to involve their bodies in the space-orientation tests.

The Embedded Figures Test. This test was developed by Witkin (9) to evaluate individual differences in perception in a nonspatial orientation task. Here the subject must deal "analytically" (9) with a visual field which is so structured as to distract him.

Witkin sees this test as a task which requires the active teasing out of a simple figure embedded in an otherwise complex field. For Witkin the test's significance resides in its correlation with the space-orientation tests. Hence he concludes (9, p. 85) that dependence on the visual field in the spatial orientation situations is related to difficulty in extracting a hidden item from its complex visual context in the Embedded Figures Test.

The test is included here to determine whether differences between dancers and the control group of college students in the "body-involving" spatial orientation tests are paralleled by differences with this "non-body-implicating" test. If bodily experiences matter for the orientations tests, no corresponding shift in performance would necessarily be expected on the Embedded Figures Test, which does not involve the body directly. On the other hand, if, as Witkin holds, these tests involve a similar perceptual function, then any observed differences might reflect on such an assumption of non-body involvement.

The score is the average time for the 24 items on the test.

The Personality Evaluation Techniques

Of the personality evaluation techniques used by Witkin and his coworkers (9), the Rorschach, Figure Drawing, and Interview were used in the present study.

The Rorschach test. The Rorschach test was used and scored according to criteria developed by Hertzman (9). A high score on these criteria indicates reduced drive, difficulty in coming to grips with the environment, low emotional control, low self-awareness, difficulty in self-acceptance, and constriction in social relationships. These criteria or signs, called collectively the Rorschach score, were found to be more prominent in subjects who depended on the visual field in the orientation tests, and among those who could not break down the field in the Embedded Figures Test. On the other hand, subjects who scored low on these signs tended to show independence of the visual field in the perceptual tests. The absence of signs was associated with active coping with reality, the presence of emotional controls, and introspectiveness.

The Figure-Drawing Test. The drawings of the human figure were scored on the basis of a system of signs developed by Machover (9) and modified by Bauman (1). High scores indicate passivity, childishness, lack of sexual differentiation, lethargy, and difficulty in accepting an adult role, and were shown to be significantly related to dependency on the visual field. Low scores, on the other hand, are seen to reflect a high degree of narcissistic investment in the body, sophisticated defenses against anxiety, self-assurance, identification with "desirable characteristics" of both sexes, strong drive, and manipulative tendencies in controlling drives.

The Interview. An Interview Score based on ratings for self-awareness, method of handling hostility, activity-passivity, method of handling

inferiority feelings, and degree of self-assurance was devised by Lewis (9). The score was devised so that the higher score indicates lack of self-awareness, repression of hostility, passivity, acceptance of inferiority, and lack of self-assurance. The low scores reflect self-awareness as manifested in the capacity for self-observation, and self-criticism, and recognition of the relation between childhood experiences and adult attitudes. They also reflect ability to act out hostile impulses, to be active in solving one's problems, to deal with inferiority feelings in a compensatory way, and the possession of self-assurance. In this study (9) the higher scores correlated with dependence on the visual field, the lower scores with independence of the visual field. (For full description of the present Interview Outline, see Appendix A.)

Procedure

In almost all cases testing was done in two sessions, each lasting between three and five hours, with time out for rest. In all but two cases the second session was held within one to two weeks following the first session.

Perceptual testing occurred in this order: Rod-and-Frame Test, Tilting-Room-Tilting-Chair Test, Stabilometer, and Embedded Figures Test. Sometimes the Figure-Drawing Test was given during the first session, but more often during the second. The Rorschach test was administered next, and finally, the Interview.

IV. Subjects

Because of their rigorous training in body balance and movement, dancers are a group with special bodily experience relevant to our problem. The 30 male and 30 female dancers of this study were drawn from various companies and schools in the New York Metropolitan area.[2] Two criteria were used in selection of the dancers:

1. A minimum of two years of active dance training.[3]

2. A recommendation of technical competence from one of the acknowledged teachers or leaders of the groups consulted.

The control group consisted of 52 men and 51 women, all Brooklyn College students, who were utilized by Witkin *et al.* (9) in their study of perception-personality relationships. Because test data for some of the control group are incomplete, the perceptual comparison between the control group and the experimental group is based on 46 males and 45 females for the former group.

In Table 1, which gives the schooling of the dancers, it is apparent that the dancers or experimental group compare

TABLE 1

Educational Background of Dancers

Education	Men	Women
H. S. Graduates	7	9
College: 6 months	4	3
1 year	4	6
2 years	7	2
3 years	0	4
College graduates	6	4
Advanced degree M.A.	2	1
Private tutoring	0	1
Total	30	30

[2] Ballet Arts, City Center Ballet Company, Katherine Dunham School of Dance and Theatre, Jean Erdman Studio, Hanja Holm School of Dance, José Limon Dance Company, Martha Graham School of Contemporary Dance, Metropolitan Opera Ballet School, New Dance Group, School of American Ballet. Some of the dancers and teachers who generously assisted in the selection were: Bonnie Bird, Maria Craske, Jane Dudley, Jean Erdman, Sylvia Fort, Sophie Maslow, Alwin Nikolais, James Nygren, Jane Stuart.

[3] Three subjects did not fully meet this criterion: one female dancer had one year and ten months experience, one male dancer had one year and four months experience, and another male dancer had one year and five months experience.

favorably with the control group, all of whom were part way through college.

The age of the control group was as follows: For men, the mean was 21.2 years, the range, 18-29; for women the mean was 19.6, the range, 17-35. The age of the experimental group was as follows: For men dancers, the mean age was 25.6 years, the range, 19-35, *SD*, 3.98 (*SD* not available for controls); for female dancers, the mean age was 26.7 years, the range, 17-40, the *SD*, 6.69. The question of age differences between control and experimental groups is discussed under Section VI.

The experience range (years of dancing) of the experimental group was as follows: For men, the mean was 5.15 years, *SD*, 4.07; for women the mean was 11.40 years, *SD*, 7.67.

V. Results on the Perception Tests

To evaluate the effect of the dancers' special body experience on their performance in the space-orientation tests and the Stabilometer Test, mean scores and variances of the experimental and control groups were compared. Similarly, mean scores and variances on the Embedded Figures Test were compared for the experimental and control groups.

Examination of Table 2 indicates that for the Tilting-Room-Tilting-Chair Test the mean performances for two out of four series are significantly more "body oriented" for the male dancers than for the controls. Differences between the variances are not significant, though Series 2*b* comes close to the .05 level.

For the Rod-and-Frame Test the mean differences between men dancers and controls are not significant. For Series 3 we see that the *SD* of the dance group is significantly smaller than that for the control group.

The Stabilometer results indicate that

TABLE 2

Significance Levels for Differences in Means and Variances Between Brooklyn College Males and Male Dancers

Variable	Mean		*t*	*p*	Sigma		*F*	*p**
	Control	Experimental			Control	Experimental		
Tilting-Room-Tilting-Chair								
Series 1*a*	54.35	36.87	2.22	.05	39.03	28.64	1.83	n.s.
Series 1*b*	98.80	82.87	1.25	n.s.	55.02	53.30	1.05	n.s.
Series 2*a*	27.11	18.57	2.86	.01	14.08	11.46	1.49	n.s.
Series 2*b*	24.24	17.33	1.78	n.s.	19.16	13.56	1.97	n.s.
Rod-and-Frame								
Series 1	98.67	108.60	.63	n.s.	64.33	67.05	1.10	n.s.
Series 2	113.15	120.96	.53	n.s.	53.78	54.25	1.03	n.s.
Series 3	56.65	52.67	.45	n.s.	49.22	26.19	3.48	.001
Embedded Figures Test (in minutes)	16.65	15.54	.42	n.s.	13.18	9.48	1.91	n.s.
Stabilometer								
No movement	272.8	329.5	2.44	.02	96.8	97.6	1.03	n.s.
Movement	181.1	212.4	1.25	n.s.	114.9	97.4	1.37	n.s.
Time on rails	28.5	21.2	.87	n.s.	39.2	32.0	1.47	n.s.

Note.—"n.s." stands for not significant. Brooklyn College *N* is 46; dance group *N* is 30.

The mean scores represent the means of added trials within each series and *not* of averaged trials within each series. As pointed out in the Method section, the number of trials per series varies from series to series.

* These probabilities are doubled in order to secure the probability irrespective of direction (McNemar [5, p. 230]; also Merrington and Thompson [6, p. 73]).

under the condition of a stable visual field the men dancers balance significantly better than the controls. When the visual field is unstable, this difference disappears. Similarly the "time on rails" score, which indicates the number of seconds a subject touches the guard rail to steady himself, shows no significant difference between experimental and control group performance of the men. Differences between variances also do not reach acceptable significance levels.

Table 3 shows that for the Tilting-Room-Tilting-Chair Test women dancers perform significantly more "body-wise" (have lower scores) in two out of the four subtests. In these two situations their variability is also significantly smaller than for the controls.

For the Rod-and-Frame Test we see that there is no significant difference between mean performances of the two groups of women, and that the differences between the variances are not significant, except that Series 3 comes close to the .05 level.

On the Stabilometer, women dancers, like male dancers, perform significantly better under conditions not involving conflict with an unstable visual field. When there is conflict, their mean score performance is not significantly different from the performance of the control group, and they use the guard rail as much as do the controls.

Table 4 gives the intercorrelations of the various perceptual tests for both the experimental and the control groups. Generally speaking these are lower for the experimental group; moreover, the pattern of intercorrelations for the experimental group is different from that of the controls. Thus, for example, we find that the direction of the correlation is reversed in nine instances for the male dancers, and in 17 for the female dancers. In addition, for men, out of 45 correlations, 30 are significant at the .05 level

TABLE 3

SIGNIFICANCE LEVELS FOR DIFFERENCES IN MEANS AND VARIANCES BETWEEN BROOKLYN COLLEGE FEMALES AND FEMALE DANCERS

Variable	Mean		t	p	Sigma		F	p^*
	Control	Experimental			Control	Experimental		
Tilting-Room-Tilting-Chair								
Series 1*a*	75.53	57.06	1.98	n.s.	39.78	38.28	1.06	n.s.
Series 1*b*	119.04	129.20	.72	n.s.	57.13	59.66	1.11	n.s.
Series 2*a*	33.04	19.36	3.45	.001	23.48	9.66	5.78	.002
Series 2*b*	27.60	14.63	3.29	.01	23.09	10.01	5.23	.002
Rod-and-Frame								
Series 1	135.49	128.66	.42	n.s.	71.73	65.07	1.19	n.s.
Series 2	153.36	169.76	1.25	n.s.	63.18	48.04	1.68	n.s.
Series 3	95.33	77.33	1.69	n.s.'	53.16	37.69	1.97	n.s.
Embedded Figures Test (in minutes)	23.07	19.06	1.35	n.s.	16.06	9.31	2.94	.002
Stabilometer								
No movement	227.1	274.0	2.38	.05	64.13	106.48	2.79	.002
Movement	117.1	134.0	.86	n.s.	81.09	82.96	1.06	n.s.
Time on rails	44.7	44.3	.04	n.s.	44.76	55.26	1.55	n.s.

Note.—Brooklyn College N is 45; dance group N is 30.
* See footnotes to Table 2.

TABLE 4

PEARSON INTERCORRELATION OF THE VARIOUS EXPERIMENTAL TASKS FOR BOTH MEN AND WOMEN DANCERS AND THE CONTROL GROUP

			Rod-and-Frame						Tilting-Room-Tilting-Chair								Stabilometer			
			1		2		3		1a		1b		2a		2b		NM		M	
			M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
R & F	2.	E	.73[a]	.32																
		C	.58[a]	.34[a]																
	3.	E	.31	.14	.37[b]	.30														
		C	.01[a]	.02[a]	.03[a]	.46[a]														
TRTC	1a.	E	.36[b]	.11	.22	.18	.03	.17												
		C	.46[a]	.08	.26	.29	.32[a]	.28												
	1b.	E	.63[a]	.35	.60[a]	−.09	.12	−.27	.02	.38[b]										
		C	.16	.43[a]	.51[a]	.44[a]	.30[a]	.44[a]	.46[a]	.51[a]										
	2a.	E	−.07	−.18	−.18	−.05	.14	.45[b]	.04	−.22	−.27	−.36[b]								
		C	.43[a]	.30[b]	.33[b]	.24	.53[a]	.54[a]	.68[a]	.50[a]	.36[b]	.23								
	2b.	E	.16	−.01	.18	−.06	.36[b]	.25	.17	−.24	.10	−.02	.56[a]	.44[b]						
		C	.49[a]	.25	.36[b]	.11	.64[a]	.49[a]	.03[a]	.40[a]	.35[b]	.26	.01[a]	.83[a]						
Stab	NM	E	−.31	−.01	−.19	.20	.12	−.03	.16	.40	−.28	.03	.14	−.30	−.15	−.26				
		C	−.20	−.29[b]	−.13	−.14	−.20	−.15	−.31[b]	−.28	−.22	−.27	−.46[a]	−.18	−.25	−.14				
	M	E	−.14	.01	−.14	−.03	.07	−.06	−.03	.24	−.38[b]	.03	.41	−.38[b]	.21	−.30	.64[a]	.53[a]		
		C	−.30	−.21	−.11	−.12	−.10	−.27	−.10	−.14	−.07	−.33[b]	−.20	−.22	−.13	−.28	.76[a]	.48[a]		
Emb		E	.32	.02	.32	.14	.36[b]	.62[a]	.31	.08	.32	−.55	.08	.64[a]	.38[b]	.24	−.01	−.01	−.01	−.04
		C	.47[a]	.03	.43[a]	.22	.76[a]	.26	.57[a]	.28	.38[a]	.17	.48[a]	.51[a]	.49[a]	.00[a]	−.31[b]	−.12	−.22	−.10

Note:—E stands for experimental group, C for control group, M for male, F for female; R & F for Rod-and-Frame, TRTC for Tilting-Room-Tilting-Chair, Stab for Stabilometer Emb for Embedded Figures; NM for no movement, M for movement. Experimental group consists of 30 men and 30 women dancers; control group, of 46 male and 45 female Brooklyn College stduents.

[a] Significant at .01 level.

[b] Significant at .05 level.

(or better) for the control group, but only 11 for the experimental group. Similarly, out of 45 correlations for the females, 18 reach the .05 level of significance (or better) for the control group, while only eight are significant in the case of the experimental group. The lower intercorrelations of the perceptual tasks for the experimental group, as well as the different pattern of their intercorrelations suggest that the perceptual situations may not be as pure factorially as Witkin supposes.

That the generally lower and less significant correlations of the experimental group are not simply a function of greater group homogeneity is indicated by Tables 2 and 3. In only one instance out of eleven is the variance of the male dancers significantly smaller than that of the control group. In the case of the women dancers, four out of eleven variances are significantly different from the variances of the control group; however, only three of these are smaller than those of the control group; the one other, the Stabilometer "no movement" variance, is larger than for the controls.

Hence we cannot attribute our results to a single factor such as body experience. Superficially one might argue that bodily experience is a factor in the results because of a seeming trend for the experimental group to be lower in performance scores than the control group. But this argument will not bear close examination. Thus, we find that the male dancers show higher (i.e., "poorer") scores on the first two series of the Rod-and-Frame Test than do the controls. Similarly, women dancers make higher mean scores for Series 1*b* of the Tilting-Room-Tilting-Chair Test and for Series 2 of the Rod-and-Frame Test. Also, there is no consistent correspondence in the experimental-control differences observed in the two groups of dancers (men and women).

The few significant differences observed could, of course, be related to the special body experience here under investigation. Yet it is apparent that these changes do not follow any kind of consistent pattern, nor do they follow Witkin's own classification of his tests, according to which Series 2*a* and 2*b* of the Tilting-Room-Tilting-Chair Test and Series 3 of the Rod-and-Frame Test are grouped together in terms of ease with which they—as opposed to the other test—presumably encourage or facilitate use of the body (9, p. 117).

Consideration of several additional features of our results makes an easy assumption of direct body-experience effects even more doubtful.

As already stated (Section III) we expected dancers to balance better than nondancers on the Stabilometer (because of their specific training in body-balance tasks). Thus we see that both Tables 2 and 3 indicate a statistically superior balancing performance on the part of the experimental group under the condition of a stable visual field. But we also see that as soon as a condition of conflict between visual and bodily cues is created (the Movement series, in which the frame confronting the subject rocks back and forth), their performance level is not significantly different from that of the control group. This result would seem to indicate that training in balance and muscular control and in attention is of little or no significance in a balancing task which involves an interacting complex of visual and kinesthetic stimulation.

Now, according to Witkin (9, p. 109) the Stabilometer is not a spatial-orientation test but rather a test of body action, in that it features motor performance, not perception as such. But what is of im-

portance here is that when *conflict* is generated between two opposing sets of cues, the resolution of this conflict between body cues and the unstable field bears no relationship to special bodily experience. Thus it would be difficult to reject the suggestion that the performance in other situations, like those of spatial orientation which also involve sets of opposing kinesthetic and visual impressions, is similarly unrelated to the factor of special body experience.

That the differences reported here are either not related to differences in body experience or not a simple function of differences in body experience alone was further suggested by the correlational analysis[4] of the relationship between differences in length of dance experience and scores on the perceptual tests. (See Section IV for means and ranges of dancers' length of dance experience.) Not one correlation[5] reached the .05 level of significance. The median correlation for male dancers between length of dance experience and perceptual performance is .10 (range of r's from $-.08$ to .26). The median correlation for women dancers is .02 (range of r's from $-.34$ to .16).

Though the adage "the more experience the better the dancer" is arguable, it is nonetheless accepted in the dance world (8). The apparent lack of relationship between amount of experience and performance on the Stabilometer Test suggests that what makes for superior balancing is learned during the first year of dance training.

In testing the effect of difference in kind of training of modern vs. ballet dancers on their perceptual performance, by comparing the mean composite index scores of these two groups (3), no significant differences were found for either men or women. This underscores the comparative irrelevancy of body experience per se as a variable in experiments of this type.

A consideration of the sex differences in performance on the spatial-orientation and other tests suggests further that body experience per se does not explain the discovered differences. It will be recalled that the dance experience of the women dancers is twice that of the men. Table 5 shows that sex differences in perceptual scores of the experimental group parallel sex differences in the control group, except for Series 2*a* of the Tilting-Room-Tilting-Chair Test, Series 1 of the Rod-and-Frame Test, and for the Embedded Figures Test. The results on Series 2*a* of the Tilting-Room-Tilting-Chair Test suggest that because of their body experience women dancers approach the male performance on a test which, according to Witkin (9, p. 117), facilitates the use of the body as a source of reference. Yet a test that according to Witkin does *not* particularly facilitate use of the body (9, p. 117), Series 1 of the Rod-and-Frame Test, also shows that the women of the experimental group approach the performance level of the males. The Embedded Figures Test, which does not involve the body, also shows that the women reach the level of male performance. These findings are not consistent either with the proposal that differences in body experience are at work here, or with Witkin's analysis of the differential way in which the spatial-

[4] All correlations reported in this study are Pearson correlations.

[5] The method of Index Score correlation is used, following Witkin's (9) procedure. The various subscores of each series within each test are summated by means of averaged standard scores. Thus an Index Score based on the average of the standard scores for each series within each test was obtained for each individual.

TABLE 5

SIGNIFICANCE LEVELS FOR DIFFERENCES IN MEANS BETWEEN MEN AND WOMEN DANCERS

Variable	Men		Women		t	p	Sex difference between controls (p)
	Mean	Sigma	Mean	Sigma			
Tilting-Room-Tilting-Chair							
Series 1*a*	36.37	28.64	57.06	38.28	2.27	.05	.01
Series 1*b*	82.87	53.30	129.20	59.66	3.12	.01	.01
Series 2*a*	18.57	11.46	19.36	9.66	.28	n.s.	.01
Series 2*b*	17.33	13.56	14.63	10.01	.86	n.s.	n.s.
Rod-and-Frame							
Series 1	108.60	67.05	128.66	65.07	1.16	n.s.	.01
Series 2	120.06	54.25	169.76	48.04	3.71	.001	.01
Series 3	52.67	26.19	77.33	37.69	2.89	.01	.01
Embedded Figures Test (in minutes)	15.54	9.48	19.06	9.31	1.44	n.s.	.01
Stabilometer							
No movement*	329.5	97.6	274.0	106.5	2.07	.05	.05
Movement*	212.4	97.4	134.0	83.0	3.30	.01	.01
Time on rails	21.2	32.0	44.3	55.3	1.94	n.s.	—

* A higher score here means better performance.
Total N is 60, including 30 men and 30 women.

orientation tests encourage or facilitate use of the body (9, p. 117).

Moreover, if ability to refer to the body as a source of reference on the space-orientation tests depended specifically on body training, sex differences should have been reversed, since women dancers have twice as much training as do men.[6] Not only does this not happen, but the Stabilometer Test—which under the no-conflict condition was shown to reflect well the training background of the experimental group as opposed to the control group—continues to indicate a significant sex difference between the dancers, despite the longer training experience of the women dancers. Consequently, it can be pointed out that even if experience is important in improving performance in a body-action test in which conflict with the visual field is not involved, the sex differences found for the control group are not narrowed in the experimental group, despite the women dancers' more extensive experience. The suggestion that differences in special body experiences are not the primary factor in the sex differences in the other perceptual situations is therefore reinforced.

The Embedded Figures Test results need special comment. This test was included in the present study because Witkin had used it for his personality study, and because it there showed high relationships with the other perceptual tests. For that reason, Witkin sees this test as being closely related to the body-adjustment tests, in terms of the structure of the tasks (9, p. 87), which is viewed as the ability to "break up" a prevailing field (9, p. 85). If this is so, then the absence of sex difference in this non-body-implicating test in the experimental group, without corresponding

[6] The mean difference in experience between men and women dancers is significant at the .01 level.

significant narrowing of sex differences on all the other body-implicating tests, further supports the impression that variables other than body experience are responsible for the observed changes.

Age differences between the experimental and control groups were eliminated as the possible other known variables by an evaluation of the relationship of age to the perceptual performance of the experimental group. The latter group gave a correlation of .03 for men and of −.01 for women. In addition, the differences in mean composite perceptual index scores for male and female dancers above and below 30 years of age were all found to be without significance (3).

Our conclusion is that, while some differences in spatial-orientation performance do exist between dancers and the control group of college students, they do not follow any pattern consistent either with Witkin's analysis of the role of the body in the spatial-orientation tests, or with any expectation of a simple body-experience hypothesis.

VI. Results of the Personality Study

To evaluate perception-personality relationships, Witkin *et al.* (9) devised a method of summating the scores of the various perceptual tests into index scores in order to correlate the perceptual performance with the scores derived from the personality study. Reference has been made to the Inde:. Score method in footnote 5, in relation to the problem of correlating perceptual performance with extent of dance experience.

The procedure of correlating perceptual index scores with scores from the personality data is utilized. To evaluate the difference between the perception-personality relationships for the experimental and control groups, tests were made of the significance of the difference between equivalent perception-personality correlations for both groups (7, p. 188).

Table 6 presents, for dancers and controls, the relationships between the various perceptual tests and the Rorschach sign score. The table indicates that all correlations for women dancers are significant at the .01 level, and shows them to be generally higher in predictive efficiency than in the control group. For the male dancers, three out of four correlations are significant at the .01 level. The Composite Index Score correlation has no counterpart in the Witkin study (9), but is added here to indicate the heightened perception-personality relationship when all perceptual tests are pooled. For the male dancers, the correlation for the Tilting-Room-Tilting-Chair Test is lower than it is for the controls. However, not one of the perception-personality relationships for the dancers differs significantly from the perception-personality relationships of

TABLE 6

Relationships Between Rorschach Sign Score and Various Perception Tests, for Experimental and Control Groups

Variable	Men		Women	
	Exp.	Control	Exp.	Control
Rod-and-Frame	.51[a]	.56[a]	.45[a]	.45[a]
Tilting-Room-Tilting-Chair	.31	.60	.52[a]	.62[a]
Embedded Figures Test	.54[a]	.51[a]	.68[a]	.37[a]
Composite Index	.59[a]		.76[a]	

[a] Significant at the .01 level.

The experimental N is 30 for both men and women. For the control men the N is 52 (except for the Embedded Figures Test, where it is 51); for the control women the N is 51.

None of the differences in r's between experimental and control groups are significant.

the control group. It is concluded that the relationship between perception scores on the one hand, and the personality variables defined by the Rorschach sign scores on the other, is of essentially the same magnitude for the experimental and for the control group.

Table 7 shows that although all the correlations between perception scores and scores on the Figure-Drawing Test are positive for the dancers, only three out of a total of eight reach any level of acceptable significance. The correlations are consistently lower for the dancers than for the control group.

The results of the Interview are given in Table 8. We see here that for the male dancers all correlations reach significance at either the .01 or .05 level, while for the women two correlations do not quite reach the .05 level of significance. None of the perception-personality relationships of the experimental group is significantly different from the perception-personality relationships of the control group.

Except for the Figure-Drawing Test, relationships between personality measures and perceptual scores do exist, are generally significant, and approximate the relationship found by Witkin *et al.* (9) for the control group. Nevertheless, the absolute size of these correlations indicates that the same personality signs used by Witkin correlated in a somewhat different pattern with the perception scores of the dancers.

The relationships would indicate in terms of Witkin's formulation (9) that passivity, anxiety, lack of insight, repressed hostility, acceptance of inferiority, and inability to recognize one's own needs are to be found more frequently at the "field-dependent" end of the perceptual scale than at the "field-independent" end. Self-insight, capacity to act out, self-assurance, ability to act out one's own needs, and ability to cope actively with the environment would, conversely, be found more frequently

TABLE 7

RELATIONSHIPS BETWEEN FIGURE-DRAWING SCORE AND VARIOUS PERCEPTION TESTS, FOR EXPERIMENTAL AND CONTROL GROUPS

Variable	Men		Women	
	Exp.	Control	Exp.	Control
Rod-and-Frame	.38[b]	.72[a]	.09	.69[a]
Tilting-Room-Tilting-Chair	.22	.76[a]	.36[b]	.57[a]
Embedded Figures Test	.28	.63[a]	.21	.49[a]
Composite Index Score	.37[b]		.21	

[a] Significant at the .01 level.
[b] Significant at the .05 level.

Experimental N is 30 for both men and women. For control men the N is 52 (except for Embedded Figures Test, where N is 51); for control women the N is 51.

The Figure-Drawing score of the control group is based on the Long Scale (9).

TABLE 8

RELATIONSHIPS BETWEEN INTERVIEW SCORE AND VARIOUS PERCEPTION TESTS, FOR EXPERIMENTAL AND CONTROL GROUPS

Variable	Men		Women	
	Exp.	Control	Exp.	Control
Rod-and-Frame	.49[b]	.62[a]	.44[b]	.47[a]
Tilting-Room-Tilting-Chair	.55[a]	.56[a]	.35	.60[a]
Embedded Figures Test	.47[b]	.46[a]	.33	.47[a]
Composite Index Score	.63[a]		.49[b]	

[a] Significant at the .01 level.
[b] Significant at the .05 level.

The experimental N for both men and women is 30. The N for the control men is 52 (except Embedded Figures Test, where the N is 51), and for the control women it is 51.

None of the differences in r's between the experimental and control groups are significant.

at the "field-independent" end.

However, the intercorrelations among the personality tests scores (see Table 9) are so low (and significant in only two instances) as to make it doubtful that the personality tests have as much communality as Witkin claims for them. It would seem more likely—especially since the personality test intercorrelations are so much lower than the perception-personality correlations—that the personality tests correlate with different factors in the perception and not with any one perceptual dimension. It is, then, possible that Witkin's conceptualization of field dependency-independency as the dimension along which performance on the perception tests is mediated is inadequate.

TABLE 9

INTERCORRELATIONS AMONG PERSONALITY TEST SCORES

	Rorschach		Figure Drawing	
	Men	Women	Men	Women
Interview	.30	.38[a]	.39[a]	−.02
Rorschach			.28	.23

[a] Significant at the .05 level.
N is 30 for both men and women.

One might suppose that the low correlations in the Figure-Drawing Test are a function of test invalidity, or, perhaps, that the personality features it measures do not correlate highly with the spatial-orientation and other perceptual scores of the dancers. Karen Machover will deal with the first possibility in a forthcoming publication[7] which will indicate that though dancers as a group show drawing characteristics which set them apart from other occupational groups, it is not considered plausible that the validity of the test as a measure of personality is thereby reduced. It is more likely, therefore, that the second alternative is closer to the truth; and if this is so, it may prove to be of importance in indicating that perception-personality relationships are not of an absolute type, but are specific to the group and to the individual under consideration.[8]

In view of the present results, however, it is important to ask what the perception-personality relationships mean. Since the perceptual performance does not correlate to the same degree or in the same pattern as in the original study, with what function or functions are the personality variables being correlated? The sets of correlations (i.e., high perception-personality relationships, with lower and different intercorrelations for perceptual scores in the case of the experimental sample) suggest that the perceptual factors which Witkin found relevant to personality do not here carry this same relevancy. All we can conclude is that perceptual performance on the various tests is related to personality. This is to be expected if we believe that behavior, whether perceptual, cognitive, or involving memory, is related to the total behavioral complex or personality structure of the person. However, we cannot now confirm Witkin's conclusions concerning the nature of the relevant perceptual variables or of the per-

[7] Personal communication, 1954.

[8] This raises the general problem of the adequacy of any formulation that would seek to identify any special function of the human organism with its more general behavioral organization. Whether such a view is plausible, or whether any function of the organism, such as perception, can be fully understood only against the framework of the total personality structure, will be dealt with in a separate paper now in preparation.

ception-personality relationships.

VII. Summary

Sixty professional dancers (30 men and 30 women) were subjected to the major conditions of the Witkin experiment (9). Their performance was compared with that of a control group of 103 college students (52 men and 51 women who had been part of Witkin's study of perception-personality relationships), in order to determine whether extensive body experiences would alter performance in space-orientation and other perceptual tasks. Since the space-orientation tasks ostensibly involve kinesthetic and visual factors, and since dancers have special experiences with the former, it was considered important to investigate whether the individual differences in spatial orientation and the perception-personality relationships found by Witkin *et al.* (9) could be verified in such a special sample.

In general, the perceptual performance of dancers does not differ from that of the control group. Such differences as do occur, however, are not consistent with a hypothesis holding experience with the body to be an important variable in space-orientation performance.

The differences in performance between experimental and control groups which do occur run counter to the theory of the nature of the space-orientation tasks evolved by Witkin: They tend to contradict Witkin's analysis of the space-orientation tasks according to the facility with which the body is utilized in their solution.

The intercorrelations of the perceptual tests of the dancers are different from, and generally lower than, those of the control group. This is viewed as suggesting that the variables entering into these situations may not be as pure, factorially, as Witkin suggests.

The perception-personality relationships of the dance groups are very similar to those of the control groups for the Rorschach and Interview techniques; but the correlations are lower for the dancers on the Figure-Drawing Test. Several hypotheses are advanced regarding the low Figure-Drawing Test correlations.

The intercorrelations among the personality tests are low and generally insignificant, suggesting that the personality tests do not have as much communality as Witkin claims for them. Furthermore, in view of the high perception-personality correlations (except in the Figure-Drawing Test) on the one hand, and the low personality tests intercorrelation on the other, it would appear that the different personality tests correlate with different sets of factors in the perception.

This suggests that performance in these perceptual tests is mediated along dimensions extending beyond the single field dependency-independency dimension proposed by Witkin; and this conclusion is supported by the lower and different pattern of intercorrelations for the perceptual performance of the dancers as contrasted with that of the controls. This different pattern of intercorrelations in turn suggests that the factorial structure of the perceptual performance of the dancers is to some extent different from that of the controls.

In view of these findings, further research on the nature of the perceptual tasks involved is necessary before conclusions can be drawn with any degree of validity concerning (*a*) their nature, and (*b*) the nature of the perception-personality relationships involved in these tasks.

APPENDIX A

THE INTERVIEW OUTLINE*

1. The Interview Variables

The five pairs of Interview Variables include:

1. Degree of awareness of self:
   A. Self-awarness present.
   B. Lack of capacity for self-observation.
2. Method of handling hostility:
   A. Hostility open, impulses acted out.
   B. Hostility repressed.
3. Activity-passivity:
   A. Active attempts to solve problems.
   B. Passive attitudes toward problems of independence and maturity.
4. Method of handling inferiority feelings:
   A. Compensatory handling of inferiority feelings.
   B. Acceptance of inferiority.
5. Degree of self-assurance during Interview.
   A. Self-assured.
   B. Anxious to please, tense.

These variables were devised by Lewis (9), and the reader is refered to the original work for further detail.

The total interview score for each individual was derived as follows: "A" characteristics were designated as having minus (—) value; "B" characteristics were designated as having plus (+) value. A total interview score was obtained for each individual by adding together — and + scores. (The lower score thus correlates with field-independence; the higher score with field-dependence.)

2. The Interview Outline

The outline form used in the present experiment is given below:

1. Birth date and birthplace.
2. Formal education.
3. Dance education.
4. Professional experience.
5. Choice of vocation:
   A. Its personal meaning
   B. How determined:
      a. What identifications, if any, did choice represent?
      b. An act of rebellion against parental authority?
6. What income was derived from dancing? Self-supporting? How realistic are the individual's aspirations and fantasies?
7. Religious feelings? Ingroup-outgroup attitudes?
8. Family background: Origin of parents, their group memberships, socioeconomic standard, occupation, education, politics, religion, friends.
9. Images of parents:
   a. Sort of person?
   b. What was admired most?
   c. What was disliked most.
   d. Who was liked better?
   e. Who influenced most?
10. How did parents get along, how did they differ from each other, sex adjustments, who made the decisions in the home?
11. Siblings: Who the favorite? Feelings of equality, inferiority, superiority?
12. Childhood:
   a. Identification with whom?
   b. Hostility to parents. Admitted? Guilt?
   c. Reaction to punishment?
   d. What were you like at 5-6 years?
   e. What is your best memory?
   f. What is your earliest memory?
   g. What was your earliest worry?
   h. Whom were you closer to at 6 years?
   i. Discipline at home?
13. Sex development:
   a. First stimulus interpreted as sex meaning.
   b. Childhood and adolescent sex experiences.
   c. How did sex knowledge develop?
   d. Did parents offer information?
   e. Homosexual experiences.
   f. General sexual attitude.
14. Social:
   a. How important are friends in your life? What do they offer? What attracts you?
   b. Number of friends.
   c. What is most offensive and irritating in other people?
15. School:
   a. Values, goals, marks, what subjects good and bad?
16. If you had an opportunity to start all over again, would you accept it, and if so how would you change yourself?
17. What makes you angry, gets your goat?

This skeleton outline was not rigidly adhered to, but was adapted to the demands of the situation.

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* Parts of this outline were influenced by the interview schedule of Adorno *et al.* in *The Authoritarian Personality.*

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